

C4217 Log Data Report

Borehole Information:

Borehole: C4217		Site: 216-U-8 Crib			
Coordinates (WA State Plane)		GWL (ft)¹: Dry	GWL Date: 02/02/2004		
North	East	Drill Date	TOC² Elevation	Total Depth (ft)	Type
Not Available	Not Available	Jan. 2004	Not Available	50	Push Hole

Casing Information:

Casing Type	Stickup (ft)	Outer Diameter (in.)	Inside Diameter (in.)	Thickness (in.)	Top (ft)	Bottom (ft)
Threaded steel	0.2	6 5/8	5 5/8	1/2	0.2	49.4

Borehole Notes:

This push-hole is located at the 12 o'clock position north of the 216-U-8 Crib boundary. Zero reference is the ground surface. The logging engineer measured a sample of casing located in a lay-down area next to the borehole. The outside casing diameter and casing thickness were measured using a caliper and a steel tape. Measurements were rounded to the nearest 1/16 in. Using an acoustic depth device, depth-to-bottom measured 49.4 ft from top-of-casing.

Logging Equipment Information:

Logging System: Gamma 1E	Type: SGLS (70%) 34TP40587A
Calibration Date: 01/2004	Calibration Reference: GJO-2004-568-TAC
Logging Procedure: MAC-HGLP 1.6.5, Rev. 0	

Logging System: Gamma 2E	Type: SGLS (70%) 34TP40587A
Calibration Date: 03/2003	Calibration Reference: GJO-2003-430-TAC
Logging Procedure: MAC-HGLP 1.6.5, Rev. 0	

Spectral Gamma Logging System (SGLS) Log Run Information:

Log Run	1	2	3 / Repeat	4	5
Date	02/02/04	02/02/04	02/02/04	02/11/04	02/11/04
Logging Engineer	Spatz	Spatz	Spatz	Spatz	Spatz
Start Depth (ft)	48.91	48.5	36.5	48.83	48.5
Finish Depth (ft)	48.91	0.5	31.5	48.83	0.5
Count Time (sec)	100	100	100	100	100
Live/Real	R	R	R	R	R
Shield (Y/N)	N	N	N	N	N
MSA Interval (ft)	N/A ³	1.0	1.0	N/A	1.0
ft/min	N/A	N/A	N/A	N/A	N/A
Pre-Verification	BE064CAB	BE064CAB	BE064CAB	AE083CAB	AE083CAB

Log Run	1	2	3 / Repeat	4	5
Start File	BE065000	BE065001	BE065050	AE084000	AE084001
Finish File	BE065000	BE065049	BE065055	AE084000	AE084049
Post-Verification	BE065CAA	BE065CAA	BE065CAA	AE085CAA	AE085CAA
Depth Return Error (in.)	N/A	0	0	N/A	-1
Comments		No fine-gain adjustment.	Repeat section.	Sonde tip is touching bottom of borehole.	No fine-gain adjustment.

Log Run	6 / Repeat				
Date	02/11/04				
Logging Engineer	Spatz				
Start Depth (ft)	35.5				
Finish Depth (ft)	30.5				
Count Time (sec)	100				
Live/Real	R				
Shield (Y/N)	N				
MSA Interval (ft)	1.0				
ft/min	N/A				
Pre-Verification	AE083CAB				
Start File	AE084050				
Finish File	AE084055				
Post-Verification	AE085CAA				
Depth Return Error (in.)					
Comments	Repeat section.				

Logging Operation Notes:

The borehole was logged with both Gamma 2E and Gamma 1E. Zero reference was ground surface. Logging was performed with a centralizer installed on the sonde. Pre- and post-survey verification measurements for SGLS Gamma 2E employed the Amersham KUT (^{40}K , ^{238}U , and ^{232}Th) verifier with serial number 82. On 02/04/2004, peak counts per second (cps) for ^{232}Th (2614 keV) were below acceptance criteria for verification files BE064CAB and BE065CAA. The borehole was relogged with Gamma 1E after evaluation of Gamma 2E calibration data indicated a significant loss of efficiency at high energy so that the system could not be calibrated. Pre- and post-survey verification measurements for SGLS Gamma 1E employed the Amersham KUT verifier with serial number 118. As instructed by Rick McCain, file AE084000 is from total depth with the logging cable under tension and the sonde tip touching the bottom plug. File AE084000 was collected at the maximum depth reached by the sonde measured from the ground surface to the crystal's center or 0.77 ft from the tip. After collecting one spectrum, the sonde was moved to the nearest 0.5-ft interval and logging continued as prescribed in the logging procedure.

Analysis Notes:

Analyst:	Sobczyk	Date:	2/13/04	Reference:	GJO-HGLP 1.6.3, Rev. 0
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SGLS Gamma 1E pre-run and post-run verification spectra were collected at the beginning and end of the day. All of the verification spectra were within the control limits. The peak counts per second at the 609-keV and 1461-keV photopeaks on the post-run verification spectrum as compared to the pre-run verification spectrum for each day were within 1.0 percent at the end of the day. The peak counts per second at the 2615-keV photopeak on the post-run verification spectrum as compared to the pre-run

verification spectrum was 22 percent higher at the end of the day. Examinations of spectra indicate that the detector functioned normally during logging, and the spectra are accepted.

Log spectra were processed in batch mode using APTEC SUPERVISOR to identify individual energy peaks and determine count rates. Verification spectra were used to determine the energy and resolution calibration for processing the data using APTEC SUPERVISOR. Concentrations were calculated in EXCEL (source file: G1EJan04.xls). Zero reference was the ground surface. Based on the field measurements, the casing configuration was assumed as one string of 6-in. casing with a thickness of 1/2 in. to 48.83 ft (total logging depth). Dead time corrections were applied when dead time surpassed 10 percent. A water correction was not required.

Log Plot Notes:

Separate log plots are provided for gross gamma and dead time, naturally occurring radionuclides (^{40}K , ^{238}U , and ^{232}Th), and man-made radionuclides. Plots of the repeat logs versus the original logs are included. For each radionuclide, the energy value of the spectral peak used for quantification is indicated. Unless otherwise noted, all radionuclides are plotted in picocuries per gram (pCi/g). The open circles indicate the minimum detectable level (MDL) for each radionuclide. Error bars on each plot represent error associated with counting statistics only and do not include errors associated with the inverse efficiency function, dead time correction, or casing correction. These errors are discussed in the calibration report. A combination plot is also included to facilitate correlation. The ^{214}Bi peak at 1764 keV was used to determine the naturally occurring ^{238}U concentrations on the combination plot rather than the ^{214}Bi peak at 609 keV because it exhibited slightly higher net counts per second.

Results and Interpretations:

^{137}Cs , ^{238}U , and ^{235}U were the man-made radionuclides detected in this borehole. ^{137}Cs was detected in the interval from 32.5 ft through 36.5 ft at concentrations ranging from 0.3 pCi/g to 37 pCi/g. The maximum concentration of ^{137}Cs was measured at 33.5 ft. ^{137}Cs was also detected at 0.5, 5.5, and 23.5 ft with concentrations near the MDL (0.2 pCi/g). After examination of the individual spectrum, it was determined that there is no evidence of a photopeak at 662 keV at 5.5 ft. This reported peak is probably the result of statistical fluctuation. ^{238}U , based on the 1001-keV photopeak, was detected in the interval between 32.5 and 34.5 ft with concentrations ranging from 39 to 300 pCi/g. The maximum concentration was measured at 33.5 ft. ^{235}U , based on the 186-keV photopeak, was detected at 33.5 ft with a concentration of 13.4 pCi/g. The MDL for ^{235}U was approximately 4 pCi/g.

The plots of the repeat logs demonstrate reasonable repeatability of the SGLS data for the natural radionuclides at energy levels of 609, 1461, 1764, and 2614 keV and for the man-made radionuclides (^{137}Cs , ^{238}U , and ^{235}U). ^{238}U , based on the 1001-keV photopeak, was detected at 31.5 ft on the repeat log and not on the original log. A photopeak at 1001 keV was apparent at 31.5 ft on the original log. However, the APTEC software did not identify this photopeak as being statistically significant.

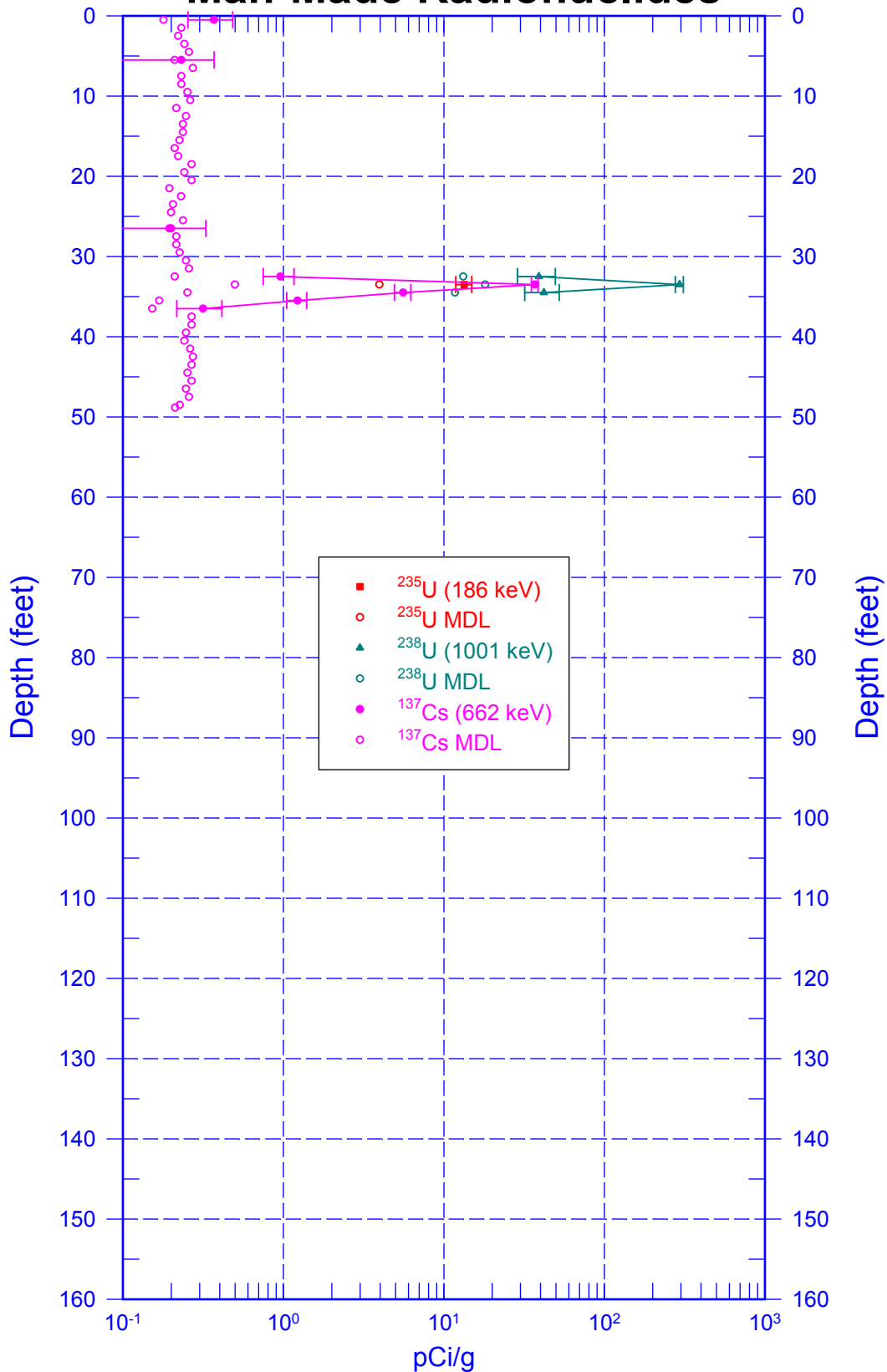
¹ GWL – groundwater level

² TOC – top of casing

³ N/A – not applicable

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Man-Made Radionuclides

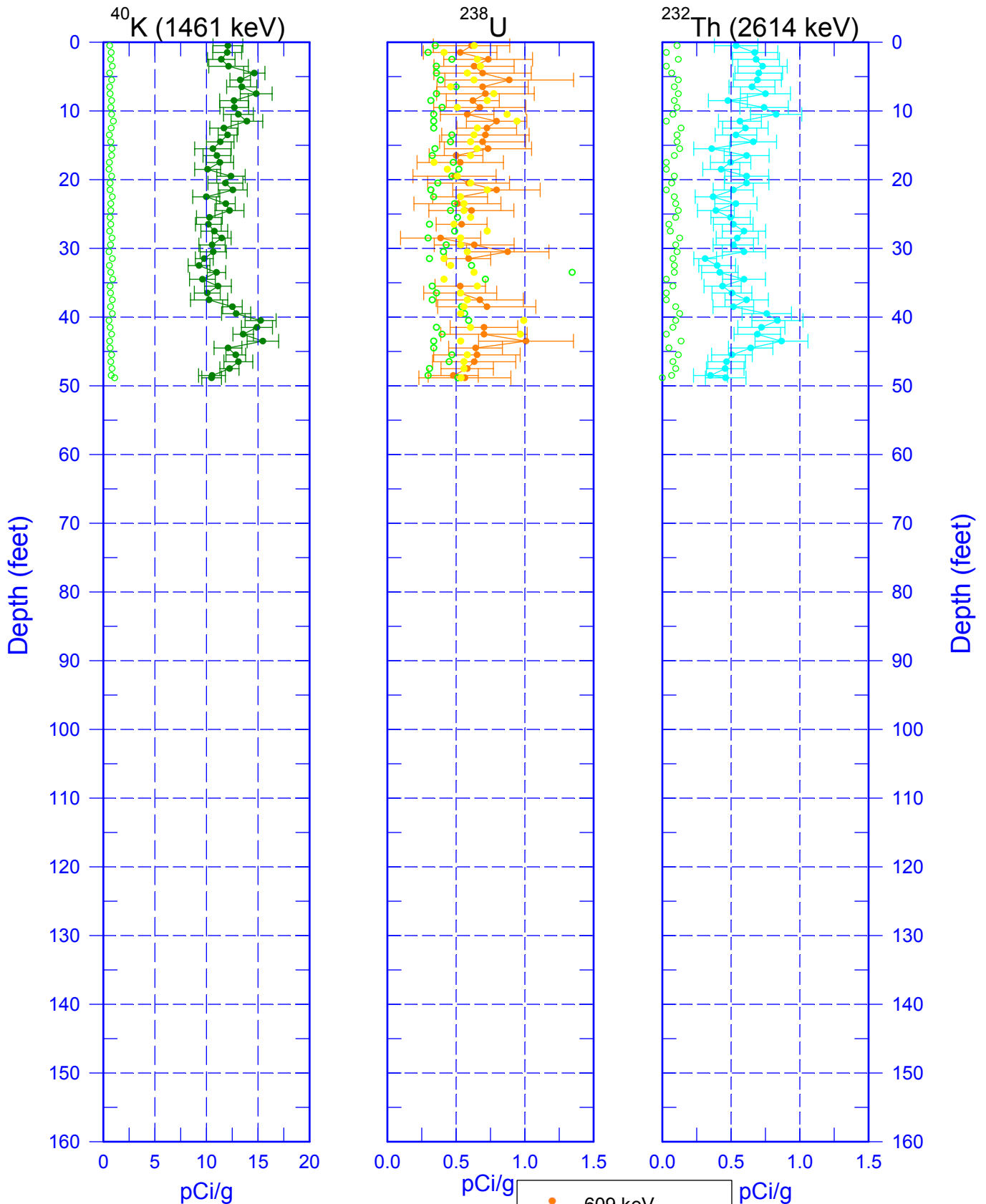


Zero Reference = Ground Surface

Date of Last Logging Run
2/11/2004

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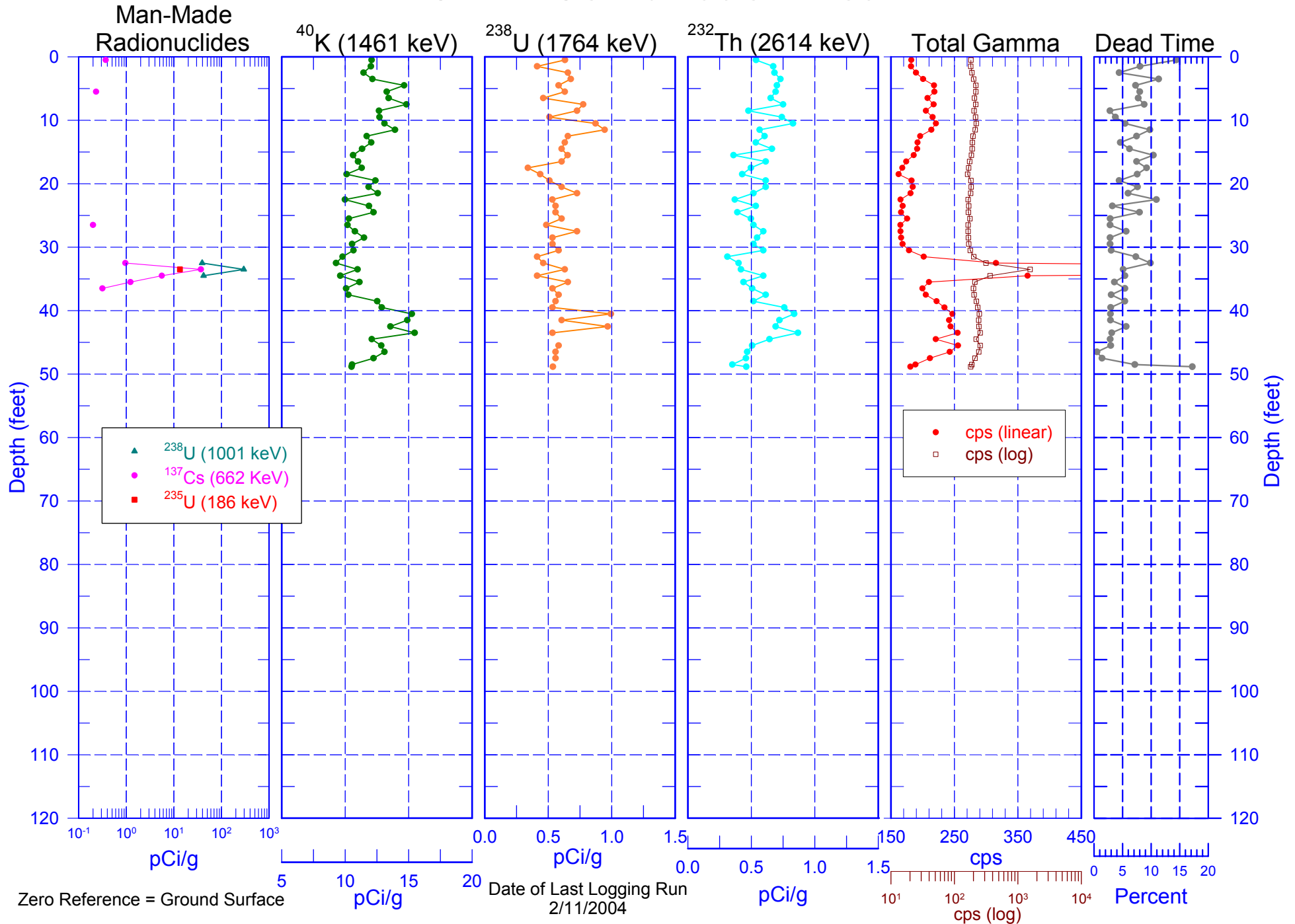
Natural Gamma Logs



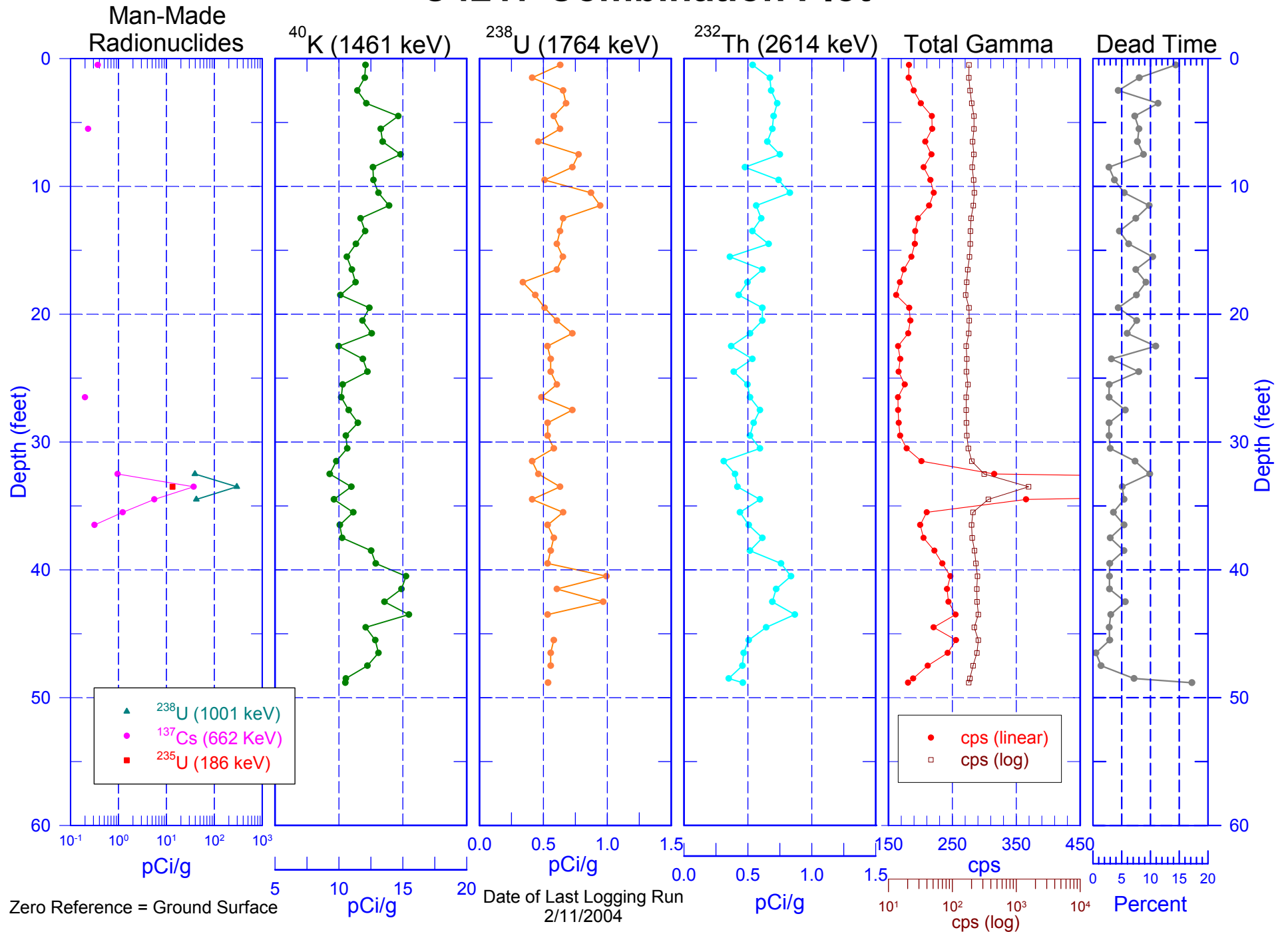
Zero Reference = Ground Surface

Date of Last Logging Run
2/11/2004

C4217 Combination Plot

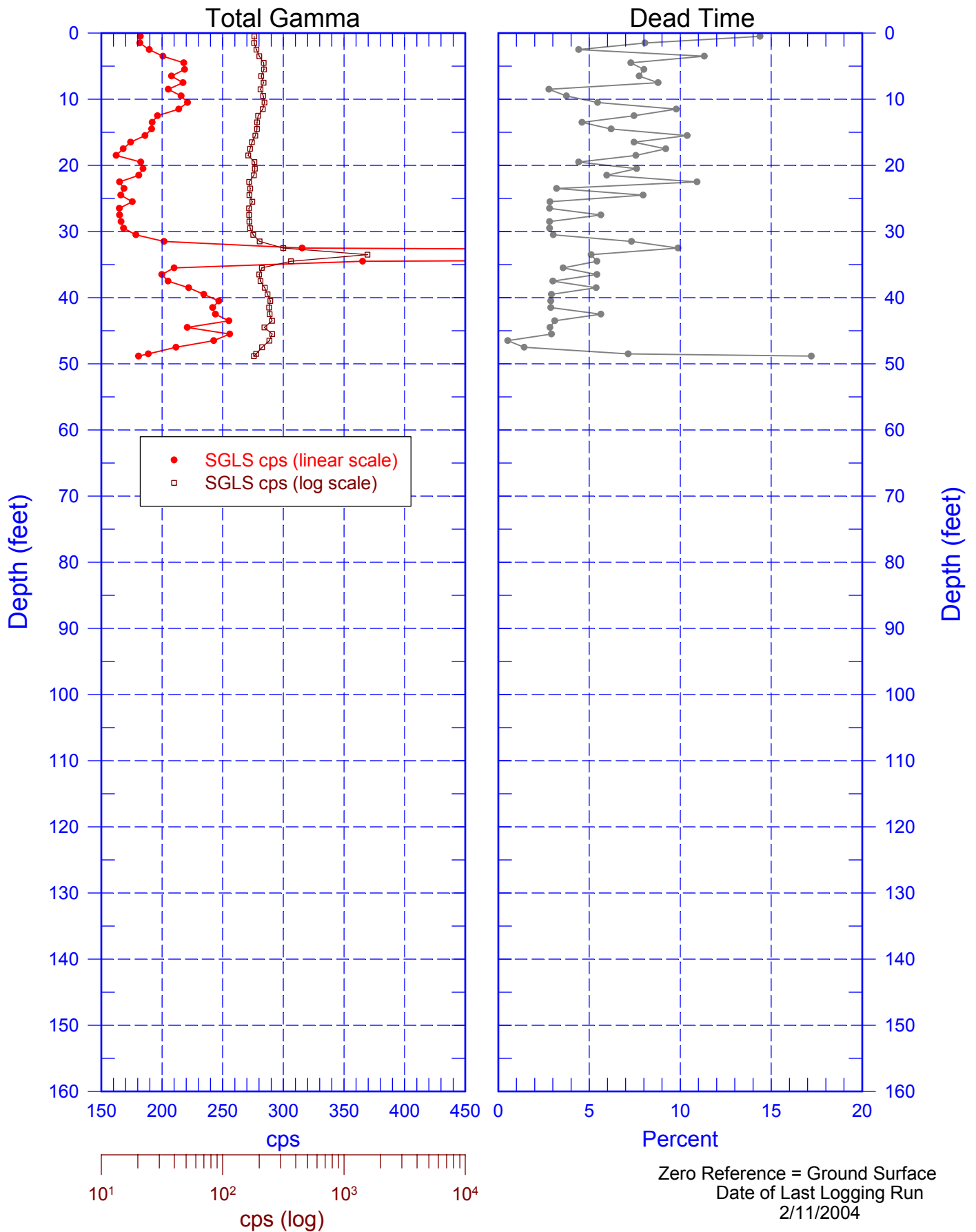


C4217 Combination Plot



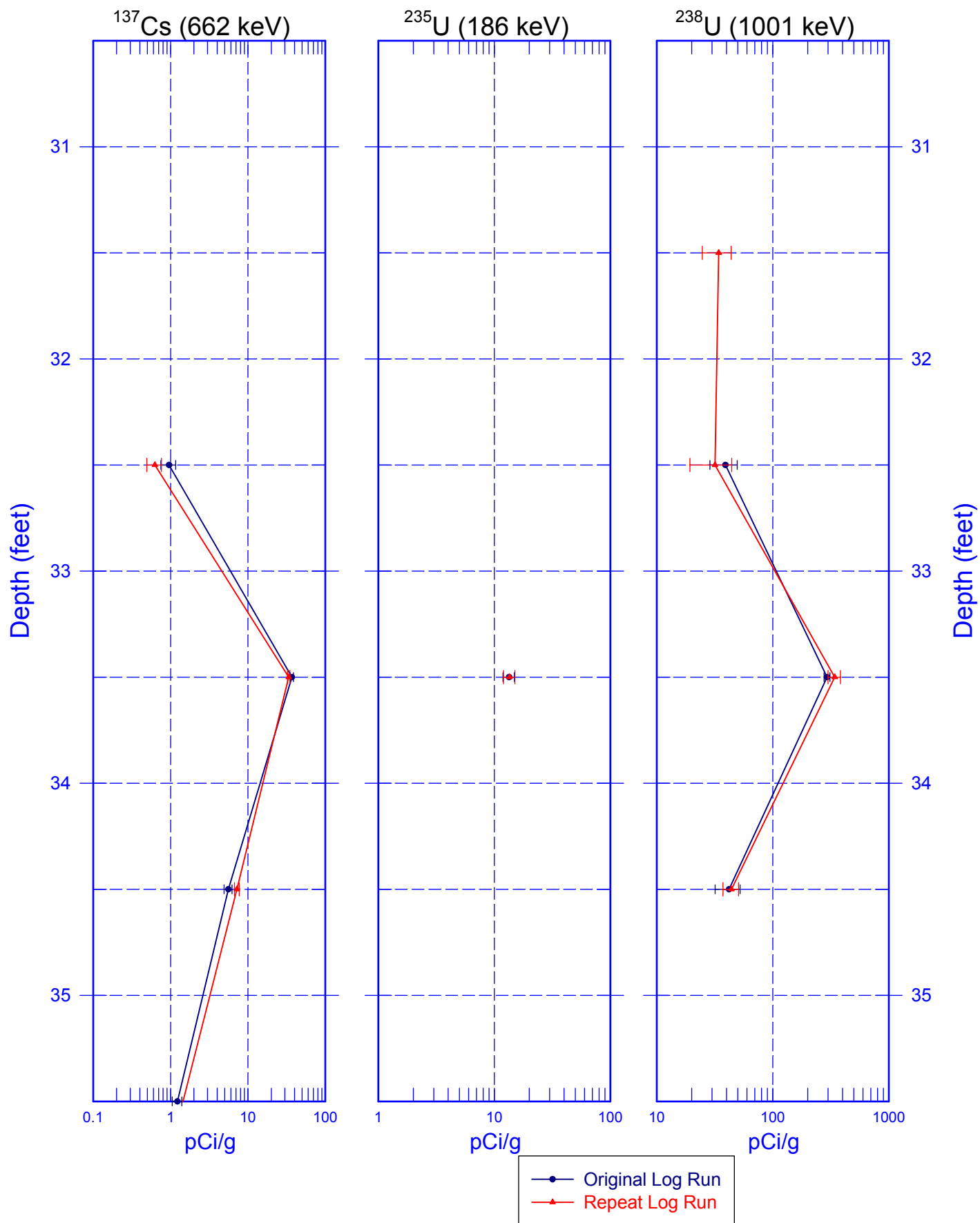
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Total Gamma & Dead Time



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Rerun of Man-Made Radionuclides



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Rerun of Natural Gamma Logs (35.5 to 30.5 ft)

